THE CLAIMS :

1. A heart actuator device for use in heart assist apparatus, the device including a paddle-like main body, the main body including a heart compressing wall, which in use is adapted to be affixed to at least a region of the heart, and a distal wall, which in use is adapted to be distal that region of the heart, and the heart compressing wall being movable in a direction relatively away from the distal wall, so as, in use to compress at least that region of the heart thereby assisting movement of the heart wall.

2. A device according to claim 1 wherein said paddle like main body includes two major walls secured to or integral with each other at the peripheral portions thereof, one of said major walls defining said heart compressing wall and the other defining said distal wall.

3. A device according to claim 1 or claim 2 wherein said heart compressing wall is generally curved inwardly towards the distal wall when in a normally relaxed condition.

4. A device according to claim 3 wherein the said distal wall is curved outwardly when in a normally relaxed condition.

5. A device according to any preceding claim including a chamber within the main body between the heart compressing wall and said distal wall and being adapted for the ingress or egress of fluid which causes the movement of the heart compressing wall.

6. A device according to any preceding claim wherein said main body is configured such that both the heart compressing wall and the distal wall are adapted to move in a direction relatively away from one another during compression of the heart.

7. A device according to claim 6 wherein the heart compressing wall and the distal wall of the main body are of the materials with different degrees of stiffness.

8. A device according to claim 7 wherein said distal wall includes a reinforcing material therein to provide for a greater degree of stiffness relative to the heart compressing wall.

9. A device according to claim 8 wherein said reinforcing material extends through the peripheral portions of device into the heart compressing wall.

10. device according to claim 8 or 9 wherein the reinforcing material is Dacron ™ mesh.

11. A device according to any preceding claim wherein at least a portion of the heart compressing wall includes a biointegratable material surface which facilitates the ingrowth of vascularised cellular tissue elements into the wall, the ingrowth of tissue into the heart compressing surface serving to affix the heart compressing wall of the main body to the heart.

12. A device according to claim 11 wherein the distal wall includes a biointegratable material that promotes vascularised cellular ingrowth into said distal wall so that it integrates into surrounding tissue.

13. A device according to claim 10 or claim 11 wherein the biointegratable material is in the form of woven Tecoflex™ mesh, Seare Biomatrix™, or Gore-Tex DualMesh ™.

14. A device according to any preceding claim wherein the paddle-like main body is deformable so as to be capable of undergoing a change from a first configuration to a second configuration, said paddle-like main body including a shape memory material which permits said deformation and subsequent return to its original shape.

15. A device according to any preceding claim wherein the main body includes a unitary structure formed of polyurethane or silicone, including reinforcement mesh or hardened material.

16. A device according to any preceding claim including means to monitor the electrical and mechanical activity of the heart.

17. A device according to claim 16 wherein the device is activated so as to boost the pump output of the heart.

18. A device according to claim 17 wherein said monitoring means includes an electrocardiogram electrode operatively connected to at least a region of the surface of the heart and the electrical signals received from the electrodes are used to monitor the intrinsic electrical activity of the heart, theses signals being also transmitted to a cardiotachometer for the detection of heart rate or beat-to-beat interval.

19. A device according to any preceding claim including a plurality of sensors adapted to measure the heart dimensions and movement or displacement of the chamber walls during excursion of the devices.

20. A device according to claim 19 wherein each sensor is a piezoelectric sensor.

21. A device according to claim 20 wherein each sensor is a sonomicrometer.

22. A device according to claim 18 wherein said ECG electrode is integrated into said heart compressing wall.

23. A device according to claim 19, 20 and 21 wherein there are a plurality of said sensors operatively connected in selective positions to said heart compressing wall.

24. A device according to any preceding claim wherein said heart compressing wall is configured so that the heart compressing surface generally conforms to the shape of that region of the heart to which it is fixed.

25. A device according to any preceding claim wherein said heart compressing wall is adapted to be affixed to a region of the left ventricle of the heart.

26. A device according to anyone of claims 1 to 25 wherein said heart compressing wall is adapted to be fixed to a region the right ventricle of the heart.

27. A device according to any preceding claim wherein the main body is at least initially affixed to the heart by straps.

28. Heart assist apparatus including one or more heart actuator devices according to any preceding claim which are adapted to be secured to a region or selected regions of the heart, said apparatus further including driving means in fluid communication with the chamber, said driving means including a controller and a power source.

29. Apparatus according to claim 28 wherein said driving means is a hydraulic driving means.

30. Apparatus according to claim 28 wherein said driving means is a pneumatic driving means.

31. Apparatus according to claim 28, 29 or 30 wherein there is provided a plurality of said heart actuator devices operatively connected to selected regions of the heart.

32. A method of assisting a failing heart using a heart actuator device according to any one of claims 1 to 27, the method including the steps of:

(a) positioning the heart compressing wall of the device at least adjacent a region of the heart;

(b) affixing the heart compressing wall with the region of the heart: and

(c) applying fluid pressure to the chamber of the device such that the heart compressing wall compresses the heart wall in the region of the heart to which the device is affixed.

33. A method of introducing a device according to any one of claims 1 to 27 to the heart of a patient, the method including the steps of:

(a) making an incision or puncture in the chest of a patient to allow access to the heart;

(b) inserting the device through the incision or puncture;

(c) affixing the heart compressing wall to a region of the heart; and

(d) applying fluid pressure to the chamber of the device such that the heart compressing wall compresses the heart wall in the region of the heart to which the device is affixed.